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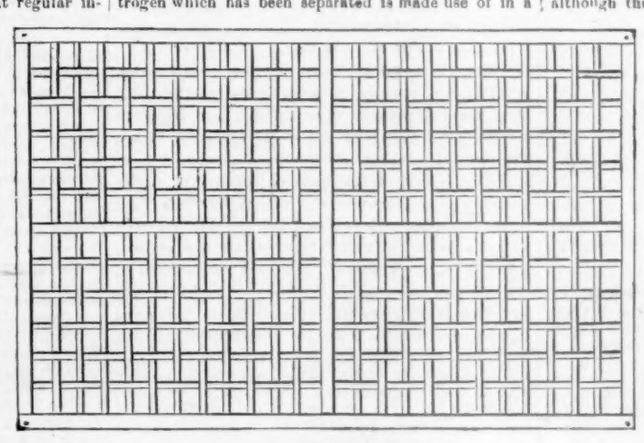
Gas Screen.

We herewith present to gas companies an illustration of a patented gas screen, now being manufactured by the "American Gas Screen Manufacturing Co.," under patents granted to Edward Duffee. It is now in use by several gas companies, and from testimonials received by the patentee, it seem to give perfect satisfaction, and they do not hesitate in recommending it as the most durable and easiest kept in order of any other yet invented.

The screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the frame and cross pieces, the edges of the frame being grooved to prevent abrasion.



GAS SCREEN.

The following advantages are claimed by the patentee:

1st. The large purifying surface, the construction of the screen giving over three-fourths of the surface for the gas to penetrate the lime.

2nd. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3rd. The saving of lime and labor, as the screens are not liable to clog, and are easily cleaned.

4th. Their lightness, cheapness, and simplicity of construction.

5th. Their *durability*—they can be used longer than any other now used.

The company are now able to supply all gas companies with the above screen. A trial is asked, and satisfaction is guaranteed.

Address "American Gas Screen Company," Haverhill, Mass.

A New Artificial Light.

The *Berggeist* describes a new artificial light which has recently been successfully experimented with. It is the Philipp carbo-oxygen lamp, and its trial during the month of March, at Cologne, was such as to win approval on every hand. The system differs from those already in existence by its simplicity, its brilliancy, and moreover, by its less noxious character. The light is generated by the simultaneous combustion of a liquid chemical compound and a current of oxygen, arrangements for the purpose being constructed. The gas is derived from the atmosphere either by chemical or mechanical means; the chemical methods being to act upon the oxygen of the air with chloride of copper (Mallett's method), or with manganate of potash (Tessie du Mothay's method), while the mechanical mode is that of utilising the different degrees of solubility of nitrogen and oxygen in waters or other liquids. By compressing atmospheric air into receivers filled with water a portion of the nitrogen is taken up by the water, while the oxygen remains insoluble in the water, the air, thus containing a goodly proportion of oxygen, is forced into a second reservoir of water, where a further amount of nitrogen is aborbed, and after the operation has been repeated seven or eight times, an atmosphere is obtained containing 97 per cent. of oxygen. The nitrogen which has been separated is made use of in a well constructed apparatus, as an auxiliary to the motive force. Experiments have established the fact that a flame fed with air containing 53 per cent. of oxygen, yields a light equal in brilliancy to that obtained with pure oxygen, and with diluted oyxgen of this kind the Philipp flame has a brilliancy of 90 to 100 candles, or ten times that of an ordinary gas jet. The liquid of a bluish white, resembling very much that of electricity and magnesium. The light employed consists of liquid hydrocarbons, very rich in carbon; it costs but little, burns economically, and can be employed only in this particular direction. The combustion is maintained in a lamp—Philipp's carbo-oxygen lamp—fitted with a wick into the flame of which the oxygen penetrates in a horizontal direction. The flame is thus made to assume the form of a star, and any heating of the wick-holder thereby prevented; if of the size and power above mentioned, the quantity of gas consumed is 5½ cubic feet per hour. As to the lamp, no special attention is necessary beyond that of filling it with liquid, as the wick is of a very durable nature, and needs no trimming. The hydro carbon employed is patented both in Europe and in America. This method of lighting is, we believe, likely to be adopted very widely. Independently of its simplicity and reasonable cost, which are indeed, extreme, it possesses the very eminent and valuable qualifications of perfect security; no explosion is in any way possible, such as not unfrequently occurs with ordinary coal gas and with hydrogen. The costly trials undertaken by Tessie du Mothay, inaugurated at the exhibition of 1866, made a profound sensation at the time, and were regarded with considerable favor, although the apparatus employed was of a very costly description, and it was necessary to employ for the purpose two gases exceedingly dangerous to manipulate, which were brought through a double series of tubes, the one for ordinary gas, and the other for oxygen; the apparatus itself, moreover, necessitated a careful and continued superintendence. All these inconveniences disappear with the new carbo-oxygen system, which, besides its application to industrial purpose—the navy, railways, military operations, etc.,—will be wonderfully well suited to photographic purposes, as has, indeed, been proved by the attainment of some very remarkable results. The *Bergg ist* concludes by saying that a method of lighting, endowed with such important qualification as the lamp invented by M. Philipp, cannot remain long before being extensively known throughout the world. —*Scientific Journal.*

Gas Explosion in Newark.—In Newark, on the 13th instant, about six o'clock, an explosion of quite a serious character took place on the premises of Mr. Henry Blon, liquor dealer, corner of Mulberry and Kinney streets, whereby a lad named Charles Stahlin, of Orchard street, was seriously though not dangerously hurt. A short time ago Mr. Blon introduced in his place an apparatus which purported to effect a great saving of gas. Yesterday he tried it for the first time, and, by some means, it exploded with terrific effect, shaking the building to its very foundation, and demolishing about $1000 worth of choice wines, champagnes, and liquors, besides a large quantity of other property. Even the furniture, mirrors, and appointments of Nicholas Weld, a barber in the basement, were shattered to pieces by the fury of the shock. The latter, through a window being opened, was, however, considerably modified. Young Stahlin was painfully burned about the face, chest, and arms.—*N. Y. Herald.*

Chemical Repertory.--No. 37.

SEPTEMBER 16, 1870.

Editor—HENRY WURTZ.

Editorial.

APOLOGETIC.

In consequence of illness and absence from the city of the Editor of this Department, he has been unable to contribute anything to this issue.

American Chemical News.

PHOTOMETRY.

The following simple formula, for correcting the sperm and gas consumptions in photometrical tests, I think will be new to the majority of photometrists. I believe Mr. CARL SCHULTZ was the first to introduce it.

This formula is deduced from the old theorem, viz., *That the illuminating power of gas or candle flames, is in direct proportion to the volume of gas, or weight of sperm consumed.*

The standard of comparison is one sperm candle.
The duration of test fifteen minutes.
The number of observations 15.

Let a — sperm consumption in 15 minutes.
Let b — sum of the 15 observations.
Let c — gas consumption in 15 minutes.
Let x — corrected candle power.
Let y — real candle power.

Correction for sperm consumption.

As— $30 : a :: \frac{b}{15} : x$

And— $30\,x = \frac{a\,b}{15}$

Hence— $x = \frac{a\,b}{450}$

Correction for Gas Consumption.

As— $c : 1.25 :: \frac{a\,b}{450} : y$

And— $c\,y = \frac{1.25\,a\,b}{450}$

Hence— $y = \frac{a\,b}{360\,c}$

This formula, when expressed in ordinary language, gives the following

RULE.—Multiply the sum of the 15 observations by the sperm consumption, for a dividend, and the gas consumption by the constant number 360 for a divisor, and the quotient will give the real candle power.

EXAMPLE.

Let the consumption of gas — 1.20 cubic feet.
Let the consumption of sperm — 31. grains.
Let the sum of the observations — 225.

$$\frac{225 \times 31}{1.20 \times 360} = 16.14 \text{ candles.}$$

As neither this, nor the old rule, is applicable when the consumption of gas or sperm varies much from the normal quantity, I will give another formula deduced from the "FARMER Theorem," viz, *That the illuminating power of gas, or candle flames is as the square of the volume of gas, or weight of sperm consumed.*

Let b — mean candle power of the observations.
Let c — consumption of gas per hour.
Aet a, x, and y — the same value as before.

Correction for Sperm Consumption.

As— $30^2 : a^2 :: b : x$

And— $900\,x = a^2\,b$

Hence— $x = \frac{a^2\,b}{900}$

Correction for Gas Consumption.

As— $c^2 : 5^2 :: \frac{a^2\,b}{900} : y$

$$c^2\,y = \frac{25\,a^2\,b}{900}$$

$$y = \frac{a^2\,b}{36\,c^2}$$

This formula, expressed in ordinary language, gives the following

RULE.—Multiply the mean candle power of the 15 observations, by the square of the sperm consumption for a dividend, and the square of the gas consumption by the constant number 36 for a divisor, and the quotient will give the real candle power.

EXAMPLE.

Let gas consumption per hour — 2.5 cubic feet.
Let sperm consumption per 15 min. — 33. grains.
Let mean of the 15 observations — 10 candles.

$$\frac{10 \times 33^2}{2.5^2 \times 36} = 48.4 \text{ candles.}$$

As the mean of the observations is used in this formula, any number of observations may be taken.

When testing rich gas, the combustion must be made as perfect as possible, by using a suitable volume of gas, and a fish-tail burner.

WILLIAM FARMER.

42 Pine street, New York, Sept. 8, 1870.

On Setting and Working Retorts.

(*Continued from page* 68.)

Mr. Siemens's regenerative gas-furnaces, which have been found to be so efficient and economical in fuel in some branches of manufacture where great heat is required, have been tried for heating gas-retorts, but I am not aware how far the application has been successful. Mr. White has tried it, I believe, to a limited extent, at the Windsor Street station of the Bir ingham Gas Company, and I understand it is in operation on a rather extensive scale at the Paris Gas-Works. Like steam stoking, the process, I apprehend, is only applicable in large works. The apparatus is rather costly, requires a good deal of room, and is somewhat complicated. The late Professor Faraday, in his last public lecture at the Royal Institution, described these furnaces in the following terms:

"The gaseous fuel is obtained by the mutual action of coal, air, and water, at a moderate red heat. A brick chamber, perhaps, 6 by 12 feet, and about 10 feet high, has one of its end walls converted into a fire-grate—*i. e.*, about half way down it is a solid plate, and for the rest of the distance consists of strong horizontal plate bars where air enters, the whole being at an inclination such as that which the side of a heap of coals would naturally take. Coals are poured, through openings above, upon this combination of wall and grate, and being fired at the under surface they burn at the place where the air enters, but as the layer of coal is from 2 feet to 3 feet thick, various operations go on in those parts of the fuel which cannot burn for want of air. Thus the upper and cooler part of the coal produces a large body of hydrocarbons; the cinders or coke which are not volatilized approach, in descending, towards the grate, that part which is nearest the grate burns with the entering air into carbonic acid, and the heat evolved ignites the mass above it; the carbonic acid, passing slowly through the ignited carbon, becomes converted into carbonic oxide, and mingles in the upper part of the chamber (or gas producer) with the hydrocarbons. The water, which is purposely introduced at the bottom of the arrangement, is first vaporized by the heat, and then decomposed by the ignited fuel, and rearranged as hydrogen and carbonic oxide; and only the ashes of the coal are removed as solid matter from the chamber at the bottom of the fire-bars.

"These mixed gases form the gaseous fuel. The nitrogen, which entered with the air at the grate, is mingled with them, constituting about a third of the whole volume. The gas rises up a large verticle tube, for 12 or 15 feet, after which it proceeds horizonally for any required distance, and then descends to the heat regenerator, through which it passes before it enters the furnaces. A regenerator is a chamber packed with fire-bricks, separated so as to allow of the passage of air or gas between them. There are four placed under a furnace. The gas ascends through one of these chambers, whilst air ascends through the neighboring chamber, and both are conducted through ports at the end of the furnace, where mingling, they burn, producing the heat due to their chemical action. Passing onwards to the other end of the furnace, they (*i. e.*, the combined gases) find precisely similar outlets down which they pass; and, traversing the two remaining regenerators from above downwards, heat them intensely, especially the upper part, and so travel on in their cooled state to the shaft or chimney. Now the passages between the four regenerators and the gas and air are supplied with valves and deflecting plates, which are like four way cocks in their action; so that, by the use of a lever, these regenerators and air-ways, which were carrying off the expended fuel, can in a moment be used for conducting air and gas into the furnace, and those which just before had served to carry air and gas into the furnace, now take the burnt fuel away to the stack. It is to be observed that the intensely heated flame which leaves the furnace for the stack always proceeds downwards through the regenerators, so that the upper part of them is most intensely ignited, keeping back, as it does, the intense heat; and so effectual are they in this action, that the gases which enter the stack to be cast into the air are not usually above 300° Fahr. of heat. On the other hand, the entering gas and air always pass upwards through the regenerators, so that they attain a temperature equal to a white heat before they meet in the furnace, and there add to the carried heat that is due to their mutual chemical action.

"Thus the regenerators are alternately heated and cooled by the outgoing and entering gas and air, and the time for alteration is from half an hour to an hour, as observation may indicate. The motive power on the gas is of two kinds: a slight excess of pressure within is kept up from the gas producer at the bottom of the regenerator, to prevent air entering and mingling with the fuel before it is burnt; but from the furnace downward through the regenerator the advance of the heated medium is governed mainly by the draught in the stack or chimney."

After describing the convenience and advantage of the process of the various manufactures—such as glass-works, etc.,—Professor Faraday concludes his lecture with the following figures:

"Carbon burnt perfectly into carbonic acid in a gas producer would evolve about 4000° of heat, but if burnt into carbonic oxide it would only evolve 1200°. The carbonic oxide, in this fuel form, carries on with it the 2800° in chemical force, which evolves, when burning in the real furnace, with a sufficient supply of air. The remaining 1200° are employed in the gas producers in distilling hydrocarbons, decomposing water, etc. The whole mixed gaseous fuel can evolve about 4000° in the furnace, to which the regenerator can return about 3600° more."

The difference between heating retorts by this and the ordinary mode appears to be that by this plan a mass of coal is distilled or carbonized in a separate brick built pit, the resultant smoke being consumed as fuel, any excess of air beyond what is required for their distillation being excluded; that the gases evolved are conveyed to the retort-oven (which in this application of the invention is the so-called furnace) by one passage or flu ; that the proper proportion of air simultaneously enters by another flue, and that they there commingle and burn, instead of the requisite quantity of air for efficient combustion entering the ordinary furnace at once in the usual way.

But, in addition to this, a second part of the process, as has been already described, consists in the gases from the producer and the entering air being made to pass upwards to the furnace through the regenerators or chambers filled with chequered walls of fire-brick, which alternately take up the surplus heat from the used or departing, and give it up again to the entering gases or air.

Now I will not presume to offer an opinion as to the advantage or otherwise of the first part of the process —viz., the separate distillation of the coal and subsequent mixing of the gas therefrom with air, when applied to gas-works where, from special reasons, it is found to be more advantageous to burn coal than coke as retort fuel; but I think when the cost of the additional apparatus and having to purchase coal for the purpose are taken into consideration, it will not be thought an improvement where coke is used instead of coal. And as respects the second or regenerative part, looking at it theoretically, it does not appear to be worth all the extra cost or trouble in any gas-works. In applications where intense heat is required, and which do not materially lower its temperature, this mode of arresting the surplus and using it over again is, of course, of the highest importance. But the application to gas-retorts is very diff rent; there heat of only a certain temperature is desirable or proper, and its enormous absorption by the retorts in converting their contents from the solid to the gaseous form, if properly utilized, reduces the temperature to about the same as it leaves the regenerators.

With regard to the plan of heating by Siemens's process, he believed it had been tried in various gas-works, but the amount of attention required in altering the current of air from one chamber to another, rendered it highly objectionable for general use.

Mr. Mead (Reigate) said he could bear out Mr.

Cathels in his observation with reference to Siemens's regenerative furnaces. He had tried it for gas making, and as far as he had gone it was a failure; but this he attributed to the want of attention on the part of the men. The furnace itself was one of the most beautiful of inventions, but the necessity for changing the direction of the air every half hour presented a great difficulty to its use, as it was almost impossible to find men who would periodically attend to a matter of this kind without constant supervision.

The Action of Water on Lead, Tin, and Copper.

Mr. Paul Casamajor, an accomplished chemist in the sugar refinery of Messrs. Havemeyer & Co., has been making some original experiments upon this vexed question which we find published in the *American Chemist*, and the importance of the subject leads us to make an abstract of the results of his researches. The presence of lead in Croton water, after standing in the lead pipes for the night, has been incontestably shown by Professor Chandler. Mr. Casamajor also proves that it is often present in the tin-lined boilers, and accounts for its presence there by the voltaic action resulting from the contact of the lead in the lining, or in the connecting pipes with the copper of the boiler. To prove this he took pieces of lead and copper and put them in contact in two flasks which he left in the dark at the temperatures of 75° Fah. and 150° Fah., for forty hours. In both instances the surface of the lead was corroded, and that metal was found to be in solution in the water. It therefore becomes a serious question what influence the imperfect lining of boilers may exert. It is essential that so much lead is used in their construction, instead of block tin, that every one of them is a galvanic battery, producing more or less poisoning. This fact has been overlooked, and while many families have taken the precaution to remove all lead pipes, they have forgotten to inquire into the composition of the kitchen boiler. On this point Mr. Casamajor remarks: "These results leave no doubt on the hurtful effect of exposing drinking water to the simultaneous action of both lead and copper. The effect of an untinned copper boiler must be felt on the cold water as well as on the hot, as all the lead pipes are in communication with the copper boilers by metallic conductors. Whether an untinned copper boiler may not even have an injurious effect on the water of a neighboring house is an inquiry before which we must pause."

The next point to be examined was, how far lead and tin react upon each other when placed in contact in water at 75° and 150° Fah. To ascertain this he instituted experiments similar to those previously described.

"At the end of twenty-four hours the flasks were examined and replaced in the dark. The lead in contact with tin was slightly tarnished, while that of the other flask (tin in water alone) remained perfectly bright. At the end of six days the tarnish of the lead in contact with tin persisted, but did not seem to have increased. This is apparently due to this circumstance, that a voltaic couple of tin and lead in aqueduct water is very weak, tin being slightly more positive than lead. Under the influence of the weak current at first produced, being more electro negative, becomes slightly oxidized, until the coat of oxide presents such a resistance to further action that the two metals are not on a par, and no current is afterwards produced. The lead of the other flask, which had now been in water for over a week, was as bright as when first put in the water." Mr. Casamajor was unable to detect the least trace of lead in the flask where the lead put in had been left in contact. And his experiments would seem to throw great doubts upon the assertions frequently made that tin and lead mutually act upon each other and poison the water. A great objection to tin-incased lead pipe and tin-lined lead pipe has been that in places where there was a fracture or where the surfaces came in contact under water a voltaic current was produced and some of the lead was carried into solution. Mr. Casamajor's experiments do not confirm this theory, but, on the contrary, he could find no lead whatever, although he put the metals in the most favorable conditions for accomplishing the reaction, if any could be expected. Lead and copper in contact under water at once react upon each other, but lead and tin appear to be neutral after the formation of the first coating. It would be gratifying to have these experiments confirmed, as a good deal of disquieting doubt has been cast upon the security that was supposed to be offered by the tin-lined and tin-incased lead pipe. In reference to the danger of leaving water in contact with lead alone, there appears to be no doubt in the mind of any person. And the danger is greatly increased by the presence of nitrates and chlorides in the water. Lead is a subtle poison, and too much care cannot be taken to prevent its presence in water that is required for domestic use.—*Scientific American.*

The Chemical History of a Candle.

BY PROFESSOR FARADAY.

[A course of Six Lectures delivered before the ROYAL INSTITUTION of Great Britain.]

LECTURE III.—(Concluded.)

PRODUCTS: WATER FROM THE COMBUSTION—NATURE OF WATER—A COMPOUND—HYDROGEN.

To return to our quiet philosophy. We shall not in future be deceived, therefore, by any changes that are produced in water. Water is the same everywhere, whether produced from the ocean or from the flame of the candle. Where, then, is this water which we get from a candle? I must anticipate a little, and tell you. It evidently comes, as to part of it from the candle, but is it within the candle beforehand? No. It is not in the candle; and it is not in the air round about the candle which is necessary for its combustion. It is neither in one nor the other; but it comes from their conjoint action, a part from the candle, a part from the air; and this we have now to trace, so that we may understand thoroughly what is the chemical history of a candle when we have it burning on our table. How shall we get at this? I, myself, know plenty of ways, but I want you to get it from the association in your own minds of what I have already told you.

I think you can see a little in this way. We had just now the case of a substance which acted upon the water in the way that Sir Humphrey Davy showed us, and which I am now going to recall to your minds by making an experiment upon this dish. It is a thing which we have to handle very carefully, for you see if I bring a little splash of water near this mass, it sets fire to part of it; and if I set fire to a part, and there was free access of air, it would set fire to the whole. Now, this is a metal—a beautiful and bright metal—which rapidly changes in the air, and, as you know, rapidly changes in water. I will put a piece on the water, and you see it burns beautifully, making a floating lamp, using the water in the place of air. Again, if we take a few iron filings or turnings and put them in water, we find that they likewise change. They do not change so much as this potassium does, but they change somewhat in the same way, they become rusty, and show an action upon the water, though in a different degree of intensity, to what this beautiful metal does; but they act upon the water in the same manner generally as this potassium. I want you to unite these different facts together in your minds. I have another metal here, and when we examined it with regard to the solid substance produced from combustion, we had an opportunity of seeing that it burnt; and I suppose if I take a little strip of this zinc and put it over the candle, you will see something half way, as it were, between the combustion of potassium on the water and the action of iron—you see there is a sort of combustion. It has burnt, leaving a white ash or residuum, and here also we find that that metal has a certain amount of action upon water.

By degrees, we have learned how to modify the action of these different substances, and to make them tell us what we want to know. And now, first of all, I take iron. It is a common thing in all chemical reactions, where we get any results of this kind, to find that it is increased by the action of heat; and if we want to examine minutely and carefully the action of bodies one upon another, we often have to refer to the action of heat. Now, you know, I think, that iron filings burn beautifully in the air; and I am about to show you an experiment of this kind, because it will impress upon you what I am going to say about iron in its action on water. If I take a flame, which I make hollow—you know why, because I want to get air to it and in it, and therefore I make it hollow—if I take a few iron filings, and drop them into the flame, you see how well they burn. That combustion proceeds from the chemical action which is going on when we ignite those particles. And so we proceed to consider these different effects, and ascertain what iron will do when it meets with water. It will tell us the story so beautifully, so gradually and regularly, that I think it will please you very much.

I have here a furnace with a pipe going through it like an iron gun-barrel, and I have stuffed that barrel full of bright iron turnings, and the part that is so stuffed is put into the fire and is made red hot. We can either send air through the barrel to come in contact with the iron, or else we can send steam from this little boiler at the end of the barrel. Here is a stop-cock which shuts out the steam from the barrel until we wish to admit it. There is some water in these jars, which I have colored blue so that you may see what happens. Now you know very well that any steam I might send through the barrel, if it went through into the water in the form of steam, would be condensed; for you have seen that steam cannot remain as steam if it be cooled down; you saw it here

(pointing to the tin flask) crushing itself into a small bulk, and causing the flask containing it to collapse. So that if I were to send steam through that barrel, it would be condensed—supposing the barrel were cold—it is, therefore, heated to perform the experiment I am about to show you. I am going to send the steam through the barrel in small quantities, and you shall judge for yourselves, when you see it issue from the other end, whether it still remains steam. Steam is condensible into water, and when you lower the temperature of steam you convert it back into fluid water; but I have lowered the temperature of the gas which I have collected in this jar, by passing it through water after it has passed through the iron barrel, and still it does not change back into water. I will take another test and apply it to this gas. (I hold the jar in an inverted position, or else I should lose my substance.) If I now apply a light to the mouth of the jar, it ignites with a slight noise. That tells you that it is not steam, steam puts a fire out, it does not burn; but you see what I had in that jar burnt. We may obtain this substance equally from water produced from the candle flame as from any other source. When it is obtained by the action of the iron upon the aqueous vapor, it leaves the iron in a state very similar to that in which these filings were when they were burnt. It makes the iron heavier than it was before. So long as the iron remains in the tube and is heated, and is cooled again without the access of either air or water, it does not change in its weight; but after having had this current of steam passed over it, it then comes out heavier than it was before, having taken something out of the steam, and having allowed something else to pass forth which we see here

And now, as we have another jar full, I will show you something most interesting. It is a combustible gas; and I might at once take this jar and set fire to its contents and show you that it is combustible; but I intend to show you more if I can. It is also a very light substance. Steam will condense; this body will rise in the air and not condense. Suppose I take another glass jar, empty of all but air; if I examine it with a taper I shall find that it contains nothing but air. I will now take this jar full of the gas that I am speaking of, and deal with it as if it were a light body; I will hold both upside down, and turn the one up under the other; and that which contains or did contain

the gas obtained from the steam, what does it contain now? You will find it now only contains air. But look! Here is the combustible substance [taking the other jar] which I have poured out of the one jar into the other. It still preserves its quality, condition, and independence, and therefore is the more worthy of our consideration, as belonging to the products of a candle.

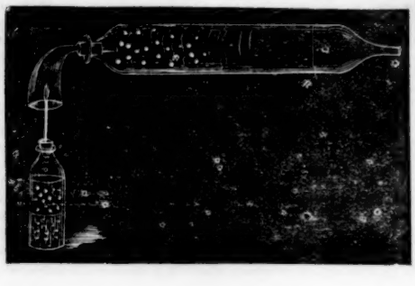
Now this substance, which we have just got by the action of iron on the steam or water, we can also get by means of those other things which you have already seen and so well upon the water. If I take a piece of potassium and make the necessary arrangements it will produce this gas; and if I take a piece of zinc, I find, when I come to examine it very carefully, that the main reason why this zinc cannot act upon the water continuously, as the other metal does, is because the result of the action of the water envelopes the zinc in a kind of protecting coat. We have learned, in consequence, that if we put into our vessel only the zinc and water, they, by themselves, do not give rise to much action; and we get no result. But suppose I proceed to dissolve off this varnish—this encumbering substance—which I can do by a little acid; the moment I do that I get the zinc acting upon the water, exactly as the iron did, but at the common temperature. The acid in no way is altered, except in its combination with the oxyd of zinc, which is produced. I have now poured the acid into the glass, and you would think I was applying heat to cause this boiling up. There is something coming off from the zinc very abundantly, which is not steam. There is a jar full of it; and you will find that I have exactly the same combustible sub-

stance remaining in this vessel, when I hold it upside down, that I produced from the experiment with the iron barrel. This is what we get from water, and this is the substance which is contained in the candle.

Let us connect these two points clearly and distinctly together. This is hydrogen—a body classed among

those things which, in chemistry, we call elements, because we can get nothing else out of them. A candle is not an elementary body, because we can get carbon out of it, we can get this hydrogen out of it, or at least out of the water which it supplies. And this gas has been so named hydrogen, because it is that element which, in association with another, generates water. Mr. Anderson having now been able to get two or three jars of gas, we shall have a few experiments to make, and I want to show you the best way of making these experiments. I won't be afraid to show you, for I like you to make experiments, if you will only make them with care and attention, and the assent of those around you. As we advance in chemistry we are obliged to deal with substances that are rather injurious, if in their wrong places; the acids and heat, and combustible things we use, might do harm if used carelessly. If you want to make hydrogen, you can make it easily from bits of zinc, and sulphuric, or muriatic acid. Here is

what in former times was called the "philosopher's" candle. It is a little phial with a cork, and a pipe or tube passing through it. And I am now putting a few little pieces of zinc into it. This little instrument I am going to apply to a useful purpose in our demonstrations, for I want to show you that you can prepare hydrogen, and make some experiments with it as you please, at your own homes. Let me here tell you why I am so careful to fill this phial nearly, and yet not quite, full. I do it because the evolued gas which, as you have seen, is very combustible, is explosive to a considerable extent when mixed with air, and might lead to harm if you were to apply a light to the end of the pipe before all the air had been swept out of the space above the water. I am about to put in the sulphuric acid. I have used very little zinc, and more sulphuric acid and water, because I want to keep it at work for some time. I, therefore, take care in this way to modify the proportions of the ingredients so that I may have a regular supply—not too quick, and not too slow. Supposing I now take a glass and put it upside down over the end of the tube, because the hydrogen is light I expect it will remain in that vessel a little while. We will now test the contents of our glass to see if there be hydrogen in it—I think I am safe in saying we have caught some [applying a light]. There it is, you see. I will now apply a light to the top of the tube. There is the hydrogen burning. There is our philosophical candle. It is a foolish, feeble sort of a flame, you may say, but it is so hot that scarcely any common flame gives out so much heat. There is the flame, and the heat of the flame, and you see it goes on burning regularly, and I am now about to put that flame to burn under a certain arrangement, in order that we may examine its results and make use of the information which we may thereby acquire. Inasmuch as the candle produces water, and this gas comes out of the water, let us see what this gives us by the same process of combustion that the candle went through when it burnt in the atmosphere, and for that purpose I am going to put the lamp under this apparatus, in



order to condense whatever may arise from the combustion within it. In the course of a short time you will see moisture appearing here in the cylinder, and you will get the water running down the side, and the water from the hydrogen flame will have absolutely the same effect upon our tests, being obtained by the same general process as in the former case. This hydrogen is a very beautiful substance. It is so light that it carries things up; it is far lighter than the atmosphere, and I dare say I can show you this by an experiment which, if you are very clever, some of you may even have skill enough to make. Here is our generator of hydrogen, and here are some soap suds I have an india rubber tube connected with the hydrogen generator, and at the end of the tube is a tobacco pipe. I can thus put the pipe into the suds and blow bubbles, by means of the hydrogen. You observe how the bubbles fall downward when I blow them with my warm breath; but notice the difference when I blow them with hydrogen. [The lecturer here blew bubbles with hydrogen, which rose to the roof of the theatre.] It shows you how light a thing this must be in order to carry with it not merely the ordinary soap-bubble, but the larger portion of a drop hanging to the bottom of it. I can show its lightness in a better way than this; larger bubbles than these may be so lifted up; indeed, in former times, balloons used to be filled with this gas. Mr. Anderson will fasten this tube on to our generator, and we shall have a stream of hydrogen here, with which we can charge this balloon made of collodion. I need not even be very careful to get all the air out, for I know the power of this gas to carry it up. [Two collodion balloons were inflated and sent up, one being held by a string.] Here is another large one, made of thin membrane, which we will fill and send up: you will see they will all remain floating about until the gas escapes.

What, then, are the comparative weight of these substances? I have a table here which will show you the proportion which their weights bear to each other. I have taken a pint and a cubic foot as the measures, and have placed opposite to them their respective figures. A pint measure of this hydrogen weighs three-quarters of our smallest weight, a grain, and a cubic foot weighs one-twelfth of an ounce; whereas a pint of water weighs 8.750 grains, and a cubic foot of water weighs almost 1,000 ounces. You, therefore, see what a vast difference there is between the weight of a cubic foot of water and a cubic foot of hydrogen.

Hydrogen gives rise to no substance that can become solid, either during combustion or afterwards as a product of its combustion; but when it burns it produces water only, and if we take a cold glass and put it over the flame of it, it becomes damp, and you have water produced immediately in abundance; and nothing is produced by its combustion but the same water which you have seen the flame of the candle produce. It is an important point for you to consider that this hydrogen is the only thing in the world that, by combustion, gives such a substance as this as its sole product.

And now we must endeavor to find some fresh proof of the general character and composition of this water, and for this purpose I will keep you a little longer, so that at our next meeting we may be better prepared for the subject. We have the power of arranging the zinc which you have seen acting upon the water by the assistance of an acid, in such a manner as to cause all the power to be evolved in the place where we require it. I have behind me a voltaic pile, and I am just about to show you, at the end of this lecture its character and power, that you may see what we shall have to deal with when we next meet. I hold here the extremities of the wires, which transport the power from behind me, and which I shall use to act on the water.

We have previously seen what a power of combustion is possessed by the potassium, or the zinc, or the iron filings; but none of them possess such energy as this. [The lecturer here made contact between the two terminal wires of the battery, when a bright flash of light was produced.] This light is, in fact, produced by a forty zinc power of burning; it is a power that I can carry about in my hands, through these wires, at pleasure; although if I applied it wrongly to myself, it would destroy me in an instant, for it is a most intense thing, and the power you see here put forth, while you count five [bringing the poles in contact and exhibiting the electric light] is equivalent to the power of several thunder storms, so great is its force. And that you may see what intense energy it has, I will take the ends of the wires which convey the power from the battery behind me, and with it I dare say I can burn this iron file. Now, this is a chemical power, and one which, when we next meet, I shall apply to water, and show you what results we are able to get.

The Copper Works at Vershire, Vt., are now employing from 250 to 300 workmen, yield about 125 tons of ore per week, and claim to be the only copper mines in the country which pay expenses. About eight tons of iron are lost every day in the process of separating and manufacturing the pure copper, but it is expected this waste will soon be obviated.

A New Agent for Extinguishing Fires.

A GREAT PROJECT IN BROOKLYN.

The average annual damage inflicted upon property by fires in the United States amounts to $50,000,000, and of this immense loss, one-half is attributed to the water with which the flames are extinguished. A company recently formed in Brooklyn, claims to have ability to prevent this additional loss, and save for the various insurance companies $30,000,000 a year. Their idea is one that has often been mooted before, namely, the suffocation of fire by means of carbonic acid gas. The properties of this gas are singular. It is composed two-thirds of oxygen, and one-third of carbon. Oxygen is an agent of combustion, but when mingled with carbon its whole character is changed, and flames cannot burn in an atmosphere containing this gas to the extent of one-fifth of its entire volume. In England, in the year 1951, a coal mine that had been burning for thirty years, over an extent of twenty-six acres, in spite of the efforts of chemists and engineers to conquer the flames, was saved from total destruction by the injection of 8,000,000 cubic feet of carbonic acid gas. It is, moreover, claimed by the Brooklyn company that this gas cannot injure the most delicate fabric or discolor plate, and is so cheap that a few dollars only would suffice to pay for enough to rescue a house of medium size from destruction. They propose to build in some central position a reservoir similar to a gasometer, and from this reservoir to lay four-inch pipes in every direction through the streets. In front of every house a valve is to be placed, to which a small India-rubber hose can easily be attached, to direct the stream of gas in any required direction.

To build a reservoir of aqueduct size, to furnish it with all the necessary retorts, and to lay down two hundred miles of pipes through the city, will, it is said, cost less than $250,000, and the projectors of the enterprise assert that one year will repay the expenditure.—*N. Y. Evening Post.*

Natural Gas Wells at Erie, Pa.

We "interviewed" the recently completed gas wells of Messrs. Busseck, Clark & Co., put down to supply their oil works, on East Tenth street, with fuel. This well, if it were possible, is even more of a success than that of Messrs. Oliver & Bacon. It was commenced about six weeks or two months since, and is 503 feet deep. The total cost of drilling, casing and the necessary pipe and fixtures to convey gas to the stills and boiler of the engine foots up about $1,600. When we arrived at the works but one fire was lit, that under the boiler, and the pressure of gas on the safety valve of the well was so great that, although the weight was at the extreme end of the lever, as much was escaping as was being consumed under the boiler. The stills being charged and ready to fire up, the manager proceeded to apply the match to the gas in each furnace, and immediately eleven fires were in operation sufficient for the purpose of distilling oil. Those of our readers who are acquainted with the distillation of oil, or who have ever been around a refinery, know the amount of fuel it would be necessary to operate on a two hundred barrel still; and yet, here by the simple turning of a stop cock, and the application of a match, eight fires were started under this still, together with two others under smaller stills, besides the fire under the boiler, and yet the supply was not near exhausted. The pressure on the safety valve of the well was, we should judge, at least one-third of what it was before the eleven fires were started. The fire produced was steady and uniform, and having had some years experience in the business of refining oil, we express the opinion that it will be found on practical trial that the oil distilled by this fuel will be much more uniform in color, and the percentage obtained greater; for the simple reason that the heat will be perfectly uniform, and at all times under the control of the distiller. But it was not to write a dissertation on the distillation of petroleum that we sat down, but simply to record another success in a development that we firmly believe is to revolutionize the manufacturing business of the city. The amount of horse power the gas from this well would produce if applied in the production of steam, we have no means of correctly stating, but it cannot be far from two hundred.—*Erie Republican.*

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith —EDS.]

Freaks of Lightning.

TERRE HAUTE, IND., August 25, 1870.

Messrs. Editors: In the *Gas Light Journal* of May 16th, is a letter from Mr. A. C. Ross, of Zanesville, detailing the "freaks of lightning with gas" which occurred in Zanesville in 1868; in May (11th) last, we were subjected to considerable loss from the same cause.

The largest church and highest steeple is the Congregationalist; the steeple was struck with lightning (third time), and by the force of the shock, the rod was torn from it and fell into the street—the fluid evidently followed down to the comb of the roof; these divided, part going one side and part to the other—followed along the tin gutters until it came to the *back* rain conductors, which run down about ten feet from the rear end of the church (passing the two front ones); passed down these conductors, entered the church on both sides about fifteen feet above the ground, and passing in, to about the middle of the wall, exploded, throwing out the bricks externally and tearing off the plastering internally. This explosion took place near to and exposed the gas pipe on the inside of the church.

In the unpaved yard in front of the church, about four feet from the inside of the foundation wall, directly over the 1½ service pipe, which conducts the gas into the church from the six (6) inch gas main, was a hole about one inch diameter on the surface, larger beneath, apparently made by the lightning. I would here state the lightning rod ran down on the side, about ten feet from the front, and I think merely discharged into the ground; the gas main running on the further side of the street in front, some seventy feet distant from the church.

A twenty (20) light wet meter was set on the front wall of the church in the basement—below the level of the outside ground, connected with the house and service pipes by two 1½ inches lead connections, each about two feet long.

The effect of the lightning on these lead connections was wonderful; the brass tube (which with the coupling attached is technically called the union) is 1½ inch external diameter; the lead pipe goes over this and is soldered to it (this I now have in my possession. I send you a rough diagram of it, also of section of lead pipe, etc.); the lead pipe was apparently heated to a certain degree its whole length—a vacuum was formed and each of them were collapsed—one solid and the other with a hole one-eighth by one-fourth in centre; in collapsing on the brass tube of the union, the lead pipe is very curiously drawn over the end, as you perceive in the diagram, corrugating the lead pipe. The inlet tube to the meter was burst open and bent; the outlet crushed in, and the box covering the dial torn to pieces. I have not examined the meter internally; the lightning set fire to the gas, and if it were not, from the fact that the floor was some fifteen (15) feet, above the meter, it might have set fire to the church, as a stream of gas through a 1½ inch pipe makes a considerable blaze; fortunately it was soon discovered and turned off.

Nor was this all—the most serious damage was to the street main; we found there was an immense leak of gas by observation at the works, and on digging down we subsequently discovered three of the hubs of the six inch and four of the four inch main, were cracked so badly that we had to remove them and re-connect with sleeves; while the lead in nearly every joint for about three hundred and fifty feet south, running to and along the four inch main, and some seven hundred feet north along the six-inch main leaked from the effects of the lightning to a greater or less degree. One of the six-inch hubs was found cracked three hundred feet, and one six hundred and fifty feet from the service pipe entering the church.

It appears that this effect on the the lead in the street mains by lightning is not singular, as Mr. Henry Stacey, Engineer of the Indianopolis Works, informed me when in conversation on this subject, that he one time had occasion to cut out the lead and return it again, in consequence of the action of lightning on his mains in that city, of one or more squares.

The opinion was expressed by eye-witnesses at the time, that there were apparently two bolts, one striking the steeple and passing down the conductors at the rear of the church, and one striking the ground in front of the same building, the two combining and passing along the 1½ service pipe, to the main.

This storm was one of the most terrific I had seen in this section, and was considered the heaviest ever experienced by the "oldest inhabitant."

Thinking a statement of these facts might prove interesting, and perhaps, might help to solve some of the mystery connected with lightning, and its effect on gas mains, I remain yours truly, R.

Freezing of Gas in the Pipes.

MANSFIELD OHIO, Aug. 24, 1870.

Messrs. Editors: I find your Journal very interesting and valuable. I have two 4 inch cast iron mains that cross a large creek, and they are exposed under arch, and every winter almost they freeze up and shut off the gas. Will you be kind enough to give me any information, through your Journal, as to how I will fix it, or otherwise. Yours, etc.,

G. S. HARRIS.

[Will some of our readers give their experience and remedy in similar cases? The liability of exposed gas pipes becoming obstructed in our coldest winter weather, is well known to be a source of no little annoyance and trouble, not only to the manufacturer of the gas, who often is in a quandary *how* and *where* to loosen the hold of *Jack Frost*; but to the consumer, who suddenly finds that "darkness reigns supreme" to his manifest disgust. If the gas is not obstructed, it often, when exposed to a low temperature, becomes so impoverished by condensation of its elements of illumination, that it "burns blue and fitful," and the consumer, unconscious of the real cause, charges it upon the devoted head of the superintendent, for "dealing out such confoundedly miserable gas." Much new and valuable matter, on this subject of condensation, from authority of high standing, will soon be laid before our readers.—EDS.]

An Invitation from Ireland to the Gas Fraternity in America.

KNOXVILLE, TENN., August 30, 1870.

Messrs. Editors: Please find enclosed P. O. order for $4 for one year's subscription to the Journal, to be sent to the following address: "John Somerville, Esq., Alliance and Dublin Consumer's Gas Co., Great Brunswick street, Dublin, Ireland."

By the way, I notice that towards the close of the late exceedingly interesting meeting of the British Association of Gas Managers, that Mr. Jones, of Dover, proposed that our "American cousins" be invited to attend the next meeting, to be held in Dublin.

Would it not be a good idea, to try and get up a party and attend. Perhaps by all going together, the expense would not be so much. At any rate it is worth suggesting in your Journal. From a letter received yesterday from my brother, he says that his directors in Dublin would give the American gentlemen a real "Irish welcome," whatever that may be.

Yours respectfully,

JAMES SOMERVILLE.

[The suggestion, as expressed by Mr. James Somerville, is certainly worth considering by the Gas Engineers of the United States. The transit is so easy and rapid at the present day, it would be a simple matter to make up a party for the voyage; and the pleasure and benefit to be derived from such a trip cannot be estimated. It will afford us pleasure to have the opinion of others upon this subject; and, if possible, devise a plan by which such a laudable project may be carried into effect.—EDS.]

Our Writing Inks.

The importance of good writing ink can hardly be over-estimated. The qualities essential to every good writing fluid are distinctness of color, freedom of flowing, durability, unalterability and the absence of all corrosive qualities. Very few of the inks in market possess these qualities, and still fewer retain them. Inks, which at first are of fair color, become dingy and illegible after a few months; when first poured into the inkstand they flow freely and take to the paper readily, but after a time the action of the air thickens and destroys them, and they gum up the pen and refuse to adhere to the paper, and almost all of them corrode ordinary steel pens, and thus destroy them in a few days. That all the qualities of a perfect ink can be combined in one fluid is not to be expected, but then it must be remembered that for ordinary purposes we can dispense with some of these qualities, and in cases where special qualities are necessary a special ink may be used, as in the case of copying ink, which does very well for common purposes, but cannot be compared with the best ink if its copying qualities be set aside.

There are two classes of work for which inks are ordinarily employed, viz.: ordinary rapid writing, of fair appearance, and the writing of important documents in which durability and unalterability are the most prominent requirements; copying inks form a class by themselves. It is evident that for ordinary correspondence, manuscripts prepared for the press, and the ordinary work of the literary man, durability and unalterability are minor considerations. To such persons it is more important that their work should be done rapidly than that it should last for a long time—that it should be clear and distinct, than that it should be unalterable. We care very little as to the length of time that the sheet before us shall retain the letters that we are tracing upon it, for before even the most evanescent ink can fade, our thoughts shall have been embodied in characters traced by the most durable of all inks—that having carbon for a basis; while the invention of Faust and Guttenberg shall have produced such a multitude of copies of them, that alteration will have been out of the question. But it is a matter of great consequence to us that the ink should flow freely from the pen, for if it fail in this time is lost, and that which might otherwise be acceptable is liable to become flat and unprofitable, for it is a curious fact that whatever tends to obstruct expression takes away from the clearness of thought, and consequently from its force and value.

Almost all the inks now in use consist of finely divided precipitates held in suspension by means of a solution of gum. This is true of all tannoferric inks, and consequently such inks cannot fail to gum up the pen to a greater or less extent. There is probably no ink at present in use that is a chemical solution, if perhaps we except some of the recent aniline inks. Indeed, all the black inks in ordinary use have iron as a basis. This is particularly the case with all those inks that appear faint at first and afterwards become black, the change being due to the fact that the proto-salt of iron used in making the ink is changed to a per-salt by the action of the oxygen of the air. The same change that occurs rapidly when the ink is spread in thin layers on paper takes place more slowly, but not less certainly, when the ink is exposed in larger quantities, as in an inkstand. Hence most good inkstands are so constructed as to expose to the air a very small surface of ink, and yet in any case the access of air cannot be entirely prevented, and therefore though deterioration may be delayed, it cannot be completely obviated. And yet it is conceded that it is impossible to produce a first-class ink having iron for its basis, except by the use of a proto-salt. The proto salts do not give a precipitate with tannic acid; the real basis of ink is therefore an almost colorless solution which penetrates into the fibre of the paper and from which, by the action of the air, a black precipitate is thrown down in the very body of the fibers. While, therefore, the black iron inks may be regarded as a sort of paint that can be laid down only on the surface of the paper, the pale inks are true dyes that penetrate to the interior. And yet whatever may be the excellence of these pale inks that afterwards turn dark, we confess that we dislike them. The writing is never fully and clearly legible until some time after it has been done. A letter written and mailed in the morning is not in fit condition to be read if received the same day. Moreover, they are very trying to the eyes of those who have a great deal of writing to do. For our own part, we regard color as the first essential quality of an ink for common use. We like to see clearly what we have written so as to

correct it *immediately*, for few journalists have an opportunity of putting in practice the Horatian maxim, *nonumque prematur in annum* (keep your articles nine years before you publish them). The *kind* of color is not so material. Deep blue forms quite as good a contrast to white as does black. Faint green, or blue, or a dilute black, are to us an abomination.

* * * * * * *

To those who prefer to use tanno ferric inks with the ingredients already combined, we would think that all such inks should be scrupulously kept from the air until they are deposited on the paper. Consequently they should be poured out in small quantities at a time, and kept in small vessels. Those who make and use large inkstands are evidently profoundly ignorant of the philosophy of ink-making and particularly is this the case where the inkstand consists of a large flat vessel exposing a surface of several square inches of ink to the air. Ink-stands should be frequently filled and always thoroughly cleansed from the residue of the old ink before the fresh is added. Particularly is the latter point important where ink of a different kind is to replace the old. Two inks may be most excellent when used separately, and yet be worthless when mixed—the chemicals in the one neutralizing those in the other. Above all never leave steel pens in the inkstand, for by so doing you injure the ink by introducing into it a metallic solution that is probably injurious, and you destroy your pen.—*Technologist.*

Electric Light.

It is well known that, when bars of two different metals are made to touch each other and heat is applied at the point of contact, a comparatively powerful current of electricity is developed. A thermo-electric pile is a battery essentially made up of a number of such couples the junctions of which can be heated at the same time. In the galena pile above referred to, a compound body —galena—is substituted for a simple metal. It may be generally stated that the amount of electricity produced on heating a thermo-electric pile is proportional to the number of couples employed. In the apparatus we have experimented with there happen to be one hundred and twenty couples.

When the pile was heated by an ordinary Bunsen gas burner and the electricity produced made to circulate round a very large electro magnet, we were able to make the latter easily support a hundred-weight. Again: the current was passed through a small induction coil and a tolerably good succession of sparks obtained. Other experiments were made to test the power of the apparatus, but these we need not detail here. It is sufficient for our purpose to know that a compartively intense electric current can be obtained in this way If, then, one hundred and twenty couples are capable of producing a strong electric current, it is obviously only necessary to greatly increase the number of plates in order to obtain an amount of electricity capable of affording a strong electric light. This is the direction in which Mr Fowler informs us two French phsicists are working, and we have learned from other sources that they have already obtained very satisfactory results. If this be so, we may expect soon to see the thermo-electric apparatus employed in every well fitted photographic studio, as the apparatus could be made to occupy but little space, and yet would be ready for use almost at a moment's notice.

At present the electric light is much less used for photographic purposes than it might be, as few persons care to expend much time in getting up a large galvanic battery, and the fumes which are sure to escape from it are by no means useful in a photographic *atelier*. Even Wilde's ingenious and beautiful machine cannot be much employed in the production of the electric light owing to the necessity for using a steam or gas engine as a source of power. If, however, it was only necessary to heat a small gas furnace, in order to have the command of a powerful actinic light, we have no doubt many would employ the electric beam who now scarcely think of using it

The above, from the *British Journal of Photography*, will, we trust, be a reminder to some of our American philosophers to continue their studies in the line of thermo-batteries. We believe that Moses G. Farmer, of Boston, Mass., is the inventor of one of the best batteries of this kind ever made; but we have heard nothing of its operations for three or four years past.

It is indeed desirable that we should be able to produce a strong electric light, without the nuisance of a great acid battery, or the steam boiler and engine. Perhaps it can be done by heat only, but we are inclined to think that a fire rather larger than that needed to operate the steam engine will be required.—*Scientific American.*

Recent American Patents.

Pertaining to the Specialties of this Journal for the two weeks ending September 16, 1870.

106,569.—Manufacture of Inflammable Gases for Fuel, etc.—William Elmer, New York City. Antedated August 12, 1870.

106,598.—Low water and High pressure Alarm.—G. B. Massey (assignor to Massey Low-water Detector Company), New York city.

106,629.—Vapor Chandelier.—C E. Smith and H. J. Rice, Columbus, Ohio.

106,630.—Vapor-Burner Street Lamp.—C. E. Smith and H. J. Rice, Columbus, Ohio.

106,662.—Steam Generator.—Jonathan M. Clark, New York city.

106,683.—Steam Pump.—Alexander Friedman, Vienna, Austria.

106,689.—Vapor Burner.—Benjamin D. Greene, Sturgis, Mich.

106,699.—Manufacture of Gas for Illumination etc.—Joshua Kidd, New York city. Patented in England January 5, 1864.

106,715.—Water-power Wheel.—John Nipp, Jr., Raleigh, Ind.

106,736.—Vapor Burner.—Willard H. Smith, New York city.

106,746.—Hot Air Furnace.—John Van, Cincinnati, O.

106,758.—Vapor Burner.—Joseph White (assignor to himself and J. B. Wickersham), Philadelphia, Pa.

107,007.—Water Wheel.—J. M. Cook (assignor of one-half his right to B. J. Bole), Lake Village, N. H.

107,072.—Vapor Burner.—J. F. Marsh, Dubuque, Iowa.

107,098.—Steam Engine.—Elting Post, Boston, Mass.

107,114.—Low Water and High Steam Indicator.—L. F. Smith, Philadelphia, Pa.

107,127.—Automatic Gas Regulator.—S. O. Trudell, Detroit, Mich.

107,161.—Steam Engine.—D. B. Caldwell (assignor to himself and J. H. McGowan), Cincinnati, Ohio.

107,181.—Steam Generator.—John C. Kilgore, Philadelphia, Pa.

107,191.—Gas Fixture.—David Milne, Norwich, N. Y.

Prices of Gas Coals—September, 1870.

[Corrected by Louis J. Belloni, Jr., 73 Pine st., N. Y.]

PROVINCIAL—DUTY, $1.25, GOLD.

	Coarse.	Slack.
Block House	$1 75 a	0 75
Gowrie	1 75 a	0 75

[Corrected by Bird, Perkins & Job, 86 South st.]

	Coarse.	Culm of Coal.
Picton	$2 25 a	1 25
Sydney	2 25 a	0 80
Langan	1 75 a	0 80
Little Glace Bay	1 75 a	1 00
Caledonia	1 60 a	0 80

A discount from the prices of the coarse coal on purchase of 5000 tons and upwards. Duty, $1.25 per ton, gold, on the coarse coal.; 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Coarse. Currency.	Slack.
Fairmount Gas Coal Co. of N. Y.	$7 50 a	0 00
Despard Coal Co	7 50 a	0 00
Penn	— a	—
Newberg Orrel Gas	— a	—
West Fairmount Gas Coal	8 00 a	—

FOREIGN COALS—SEPT. 1870.

DUTY, $1.25 PER TON.

[Corrected by Parmelee Bros., 32 Pine street, N. Y.]

Liverpool Gas Caking	$8 00 a —
" " Cannel	10 00 a 12 00
" House	13 50 a 15 00
" " Orrel	12 00 a 14 00

Per ton 2,240 lbs. ex ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00 a 17 50
" " Cannel "	18 00 a 20 00

Per ton 2,000 lbs. delivered.

Copper mining has ceased to pay in the Lake Superior region; on the 1st instant the Cliff—one of the oldest, finest, and most successful of the mines in the mineral range—suspended operations.

A SYNOPSIS OF
BRITISH GAS LIGHTING.
To be Published Shortly.

"WINNOWED.—The wheat carefully preserved, and the chaff thrown away."

This work will comprise the essence of the London *Journal of Gas-Lighting*, from February 10, 1849, to December 31, 1867, and afford a succinct resume of the entire English Gas Engineering between these dates.

The excerpts will, as far as possible be symmetrically arranged under the heads of Coals, Distillation, Purification, Volumetry and Photometry.

It is to be executed by JAMES R. SMEDBERG, Engineer San Francisco Gas-Light Company. Subscriptions should be addressed to the offices of the AMERICAN GAS-LIGHT JOURNAL, 42 Pine st Room 18, New York.

It will be issued only to subscribers.

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Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

FRIDAY, SEPTEMBER 16 1870.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

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GENERAL EDITORIAL.

CORROSION OF IRON GAS AND WATER MAINS.

The deposits which form in the interior of iron water-mains, cause serious annoyance and loss to many of our water companies. To so great a degree does this evil extend, that strenuous efforts are being made to substitute some other material for iron, which shall possess all its valuable qualities, and at the same time be free from liability to corrosion, and consequent obstruction. The appearance of this internal deposit is very singular and assumes various modifications. Sometimes the corrosion is of a uniform thickness, and appears to attack the surface of the iron evenly, while at others, the whole diameter of the pipe is jagged with tubercles of various sizes and shapes, occuring at irregular intervals.

Thus far no satisfactory explanation has been given of the causes of this peculiar deposit. That it is a species of oxidation is very clear, since the mass formed has all the external characteristics of iron rust; but why it should assume such peculiar physical properties, and present a configuration so unlike the outward forms of other oxidation, has not yet been satisfactorily explained.

The effect of this incrustation is obviously very disastrous to the economical distribution of water, as the diameter of the main is so much diminished as to reduce their capacity to that of much smaller calibre than they were originally constructed. In addition to this, the strength of the pipe is much impaired by this process of oxidation, and it is rendered much less able to bear sudden concussions and heavy pressure than previous to the formation of the deposit. This must be apparent to all intelligent observers, for it is at the expense of the iron that the incrustation arises. These facts are but too well known to engineers, who are fully cognizant of the difficulty under which they labor in endeavoring to remedy the evil.

The same evil obtains in regard to gas pipe, only in a less degree. The corrosion forms dust and scales, which drop off in time, and obstruct valves traps, elbows, and connections. This is especially observable in inclined and vertical piping, such as lamp posts, etc.

It has been a question with practical men, whether to substitute some other material for iron, or to adopt some means of internally coating iron mains so as to preclude all possibility of the formation of accretions.

Methods have been tried to coat the interior of iron water pipes with some substance which would protect the surface of the iron from contact with the water. This would seem to be the only remedy, but attempts in this direction have heretofore been attended with so much expense as to remove one of the strongest arguments in favor of the employment of iron, viz., the economy of its application. Some few years ago, the Water Board in Brooklyn coated the interior of their iron main with a mixture of coal-tar and linseed oil, applied at a high temperature, but we have never heard whether that remedy has been effectual in checking the formation of accretions. It was said to impose an additional cost of $2.50 per ton on the mains.

Recently, Prof. Henry Wurtz, of New York, has invented a peculiar cement for making gas or water pipes, and especially, adapted to coat the interior of gas mains, to make them perfectly impervious even to Hydrogen gas, and to prevent corrosion.

Among the materials, other than iron, which have been commended and used to some extent for water pipes, are wood, iron-bound wood, and cement, and bituminized paper. Plain wooden pipes have been immemorially employed in some places for distributing water, and are still used in many instances. Pipes made of wood and cement have also been adopted to a limited extent. They are durable, easily made, and have been made to withstand a pressure of 400 lb. to the square inch.

The pipes constructed of sheet iron, lined and coated externally with hydraulic cement, are said to be well adapted for distributing water where very cold weather does not prevail; frost being inimical to the integrity of the pipe. So also is high pressure said to be liable to injure the continuity of this kind of piping, especially at the numerous joints and connections.

In England, pipes made of bituminized paper have been employed in distributing both water and gas, but we have not heard that it has become popular to any great extent. It also was attempted to be introduced into this country, but without success, we believe.

Another description of pipe is constructed of wood, being bored from the solid log, lined with cement, and coated exteriorly with coal-tar. This form of pipe is said to be extremely durable, and not being subjected to expansion and contraction by change of temperature, is entirely free from leakage.

In England and France, as well as in this country, the complaints on this score are wide and deep, and a wide field is open for enterprise in introducing an especial remedy.

The Wyckoff wooden water and gas pipe, which is the pipe above refered to, is manufactured principally in Elmira, New York, by J. S. Hobbie & Son, and is strong, durable, and economical.

It is impermeable to water and gas. The joints are light and quickly made, and are readily lapped. It is lighter than iron, and has none of the difficulties attending metal pipes, such as oxidation, contraction, expansion, etc. In short, the making and repairs on the pipes are said to be much cheaper and more easily done than in metal pipes.

UTILIZATION OF SLAG—A FIELD FOR INVENTIVE GENIUS.

Slag—or cinder, as it is called in this country—has, in Europe, been recently found to be of great value, having been moulded into many useful and beautiful articles. In the United States the difficulty has always been to know what to do with it.

Some of our readers may not know what slag is, so we will briefly describe it. In all iron-blasting furnaces, hard and soft or bog iron ore, limestone and coal are thrown into the furnace in layers. A strong draft of air is kept constantly blowing underneath, to keep the fire burning. The heat from the coal and limestone causes the iron ore to melt, thereby letting loose the iron, which being the heavier falls to the bottom of the furnace of its own weight. The remainder is a conglomerate of limestone, sand, rock, and other earthy substances, and is called slag. This is drawn off from time to time and hauled away, no use being made of it. When cool it is exceedingly brittle and hard, being rapidly cooled by the application of a stream of water, which is doubtless the reason for its brittleness and hardness. Its color is gray, with beautiful streaks of black running through it in every direction.

At Aulnege, in Belgium, this refuse has been cast into slabs for pavements and paving purposes generally, into garden rollers, and posts and pillars; and it is said in some forms to represent artificia

porphyry. Now, as it has always, in this country and in Europe, involved the proprietors of blasting furnaces in considerable expense to get rid of it, the moulding of this melted lava for building, paving, architectural, and ornamental purposes has opened a new field for inventive genius. American inventors have found uses for many hitherto waste materials, which have been made subservient to the comfort and luxury of man.

There is no reason why, if a slower process of cooling were adopted, slag could not be made less brittle, and consequently more valuable. Of course, in drawing it off, it can be moulded into any form desired—into blocks for building, into mantels, and other forms of ornamental architecture, as well as for paving purposes, and for park and garden rollers. If slag is useful for any of the purposes to which it appears to have been put in Belgium, it is useful for many, and can be moulded into a thousand forms. It is susceptible of great polish, and is exceedingly beautiful.

We trust the proprietors of our northern New York and Pennsylvania blasting furnaces will try the experiment.

GAS SCREENS.

We would call the attention of gas companies to the illustration on first page, also to advertisement on page 89, of a Patent Gas Screen now being manufactured by the "American Gas Screen Manufacturing Company," under the patents granted to Mr. Edward Duffee. The Screen is said to possess many points of excellence and superiority over all other screens now in use, as the following advantages will show, viz., the large purifying surface; free passage of the gas through the screen, thereby reducing the pressure, and preventing the accumulation of carbon on the retorts; saving of time and labor, as they are not liable to clog, and are easily cleaned; cheapness, lightness, and simplicity of construction, and *durability* From the numerous list of gas companies who have them now in use, it shows conclusively that it has proved satisfactory on all points. Gas companies can be supplied by addressing "American Gas Screen Company," Haverhill, Mass.

SMEDBERG'S SYNOPSIS OF BRITISH GAS LIGHTING.

We are in receipt of the Engineer's Index of the London Journal of Gas Lighting, from vols. 1 to 17, compiled by James R. Smedberg, C. E.

It is handsomely printed, and the immense amount of labor the compiler has expended upon the "Synopsis," is readily apparent by a glance at the *Index*, which contains 80 pages octavo.

Every department of the manufacture of gas, of gas works, gas apparatus, gas distribution, tools, and of the hundreds of improvements and patents appertaining to gas, and gas apparatus, and manipulation etc. etc., is exhaustively treated upon.

As an example, the total number of extracts in the above exposition is (977) nine hundred and seventy-seven, and the total number of patents described and referred to, is (1205) one thousand two hundred and five.

We here introduce the preface to the Index which will speak for itself:

PREFACE.

In offering this pamphlet to the Gas-Makers of the country, it is mainly intended as the *avant courier* of that long promised compilation, the "Synopsis of British Gas Lighting."

While making final arrangements for the publication of the latter, I have been gratified to find that this Index is a means of access to treasure-houses previously barricaded by matter of only local or temporary interest; and it is distributed partly that others may receive similar benefit.

But another motive operates as well;—the wish to show to those best qualified to judge, how very valuable the "Synopsis" will be, as containing, in a single volume, all matter of which this is a mere catalogue.

The "Synopsis" is a costly undertaking, and must be very generally supported by the Gas Companies. I therefore ask you to exercise what influence you fairly can to that end.

All that I claim in the matter is industrious labor with a worthy object.

JAMES R. SMEDBERG.

San Francisco Gas Works, August 22, 1870.

We trust all who desire to get the advantage of the low subscription price allowed to subscribers before publication, will now subscribe for this valuable work (to be paid *when published* and ready for delivery), and send on their names at once. The work will be put to press immediately.

CORRECTION.—McMILLIN'S PURIFYING PROCESS.

In the report regarding the use of McMillin's Purifying Dust, in the Columbus Gas Works, Ohio, the statement was made, viz: "About 30 bushels being sufficient to purify 5000 cubic feet per day, continuously, and without any addition or renewal." The amount of gas purified should read 75,000 *cubic feet per day*, instead of 5000.

CONDENSATION.

We have received from Mr Smedberg, a very interesting and important article on "Condensation," accompanied by an illustration, which we have placed in the hands of our artist, and will be published in our next issue.

APOLOGETIC.

We must apologize to our numerous readers for the lateness of the present issue, owing to matters of some importance, which we are desirous to lay before them, in reference to the "Synopsis," which came to hand at a late hour.

"Synopsis of British Gas-Lighting."

The following subscriber to the above work is acknowledged, making in all 216:

William Farmer, Manhattan Gas Works, 18th street, North River, New York.

John L. Tucker, P. O. Box 2641, Boston, Mass.

Ira P. Rankin, Pres. Pacific Pneumatic Gas Co., San Francisco.

Every Saturday—A copy of this really handsomely illustrated weekly has been received. In the scope, variety, excellence, and number of its illustrations it excels, beyond comparison, any other illustrated paper published in this country. The publishers of this journal (Fields, Osgood & Co., Boston,) has hit upon the right course, and as a consequence have been successful from the start. They spare no pains or expense to make it more and more worthy of the patronage with which it has been received by the public, and we wish them every success. "Every Saturday" is for sale by all news dealers. Price 10 cents per number or $5 per annum.

Answers to Correspondents.

E. C. P., of Mass.—The first gas meter was constructed in 1815 by Mr. Clegg. Previous to that time gas was sold at an annual rent, at so much per burner. Mr. Clegg adopted several expedients to register the gas, and finally hit upon the revolving drum, as is now used in the ordinary wet gas meter. This was patented about the year 1816. Mr. Malam patented the first dry meter in 1820.

B. W. S., of Ind.—Generally there is more sulphur in cannel than in caking bituminous coals. Consequently cannel coal requires more attention in the purifying house than that made from ordinary caking coal. There are exceptions to this rule, but broadly speaking, it may be assumed as correct.

J. L., of Me.—Your Journal is sent regularly—there must be some carelessness in the Post Office.

AMERICAN

Gas Screen Manufacturing Company.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the new and improved Patent GAS SCREEN, now being manufactured by the "American Gas Screen Manufacturing Company," under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other Screens now in use.

The Screen is made with an Oak Frame, interlaced with split rattan drawn through holes at regular intervals in the Frame and cross pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the Screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2nd. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3rd. The saving of lime and labor, as the screens are not liable to clog, and are easily cleaned,

4th. Their cheapness and simplicity of construction.

5th. Their *durability*—they can be used longer than any other now used.

Testimonials.

EAST BOSTON, February 22, 1870.

Mr. E. DUFFEE—Dear Sir: We have used your Trays for the last five years in our works, and find them to last the longest, and give the best satisfaction of any we have ever used.

Respectfully yours,
WM. W. WEST, Sup't.

CHELSEA, July 20, 1870.

Mr. E. DUFFEE—Dear Sir: I have used your Purifying Trays for three years, with entire satisfaction to our company. For durability and cheapness I am convinced they are the best with which I am acquainted. By the increased purifying capacity of your Trays, it relieves the pressure on the retorts, and prevents the accumulation of carbon, and also saves lime and labor.

J. M. SOMER, Sup. Chelsea Gas Co.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE—Dear Sir: We have had your Gas Trays in constant use for almost one year and six months, and find them superior to any others we have ever used, both in point of economy and efficiency.

Truly yours,
W. B. BROOKS,
Agent Dorchester Gas-Light Co.

BANGOR, August 2, 1870.

EDWARD DUFFEE, ESQ.—Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays I take pleasure in saying that they have been in use over two years and have given perfect satisfaction, and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted.

Respectfully yours,
W. H. PERRY, Superintendent.

The following Gas Companies are now using the American Gas Screen Company's Screen:

Boston Gas-Light Co., Mass.	Fall River Gas-Light Co., Mass.
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Chelsea Gas-Light Co., Mass.	Concord Gas-Light Co., N. H.
Dorchester Gas Light Co., Mass.	Dover Gas-Light Co., N. H.
Roxbury Gas-Light Co., Mass.	Great Falls Gas-Light Co., N. H.
Jamaica Plain Gas-Light Co., Mass.	Bangor Gas-Light Co., Maine.
Salem Gas-Light Co., Mass.	Lewiston Gas-Light Co., Maine.
Lawrence Gas Light Co., Mass	Biddeford Gas-Light Co., Maine.
Haverhill Gas-Light Co., Mass.	Providence Gas-Light Co., R. I.
Taunton Gas-Light Co., Mass.	Woonsocket Gas-Light Co., R. I.
Newburyport Gas-Light Co., Mass.	Meriden Gas-Light Co., Conn.
Malden Gas Light Co., Mass.	Bridgeport Gas-Light Co., Conn.
Webster Gas Light Co., Mass.	Philadelphia (Northern Liberty) Gas-Light Co., Pa.

The Company are now able to supply all Gas Companies with the above Screen. A trial is asked and satisfaction is guaranteed. Address

American Gas Screen Company,
Haverhill, Mass.

S. D. MAYNARD, President.
GEORGE W. DAY, Treasurer.
LUTHER DAY, Agent.
E. DUFFEE, Travelling Agent.

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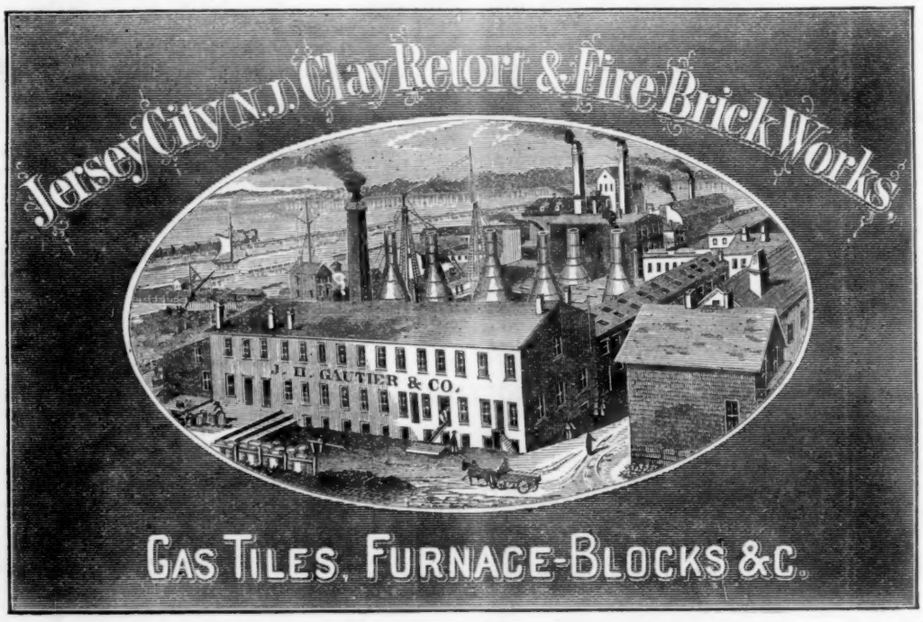
IMPORTANT.

GAS COMPANIES MAY REDUCE THEIR working expences 20 per cent, by using KIDD'S Patent Method of making Gas from Petroleum Naphtha, and other oils. Inferior coal may be used, and the charge retained longer in retorts; six gallons of Crude Naphtha, costing seven cents per gallon, will generate 1000 feet of 22 candle gas.

This Gas is a pure Hydrocarbon, and requires neither washing, purifying, or cooling, but may be passed directly from the Retort to the Holder, and used for enriching gas poor in carbon.

Joshua Kidd, Gas Engineer,
74 Maiden Lane, N. Y.



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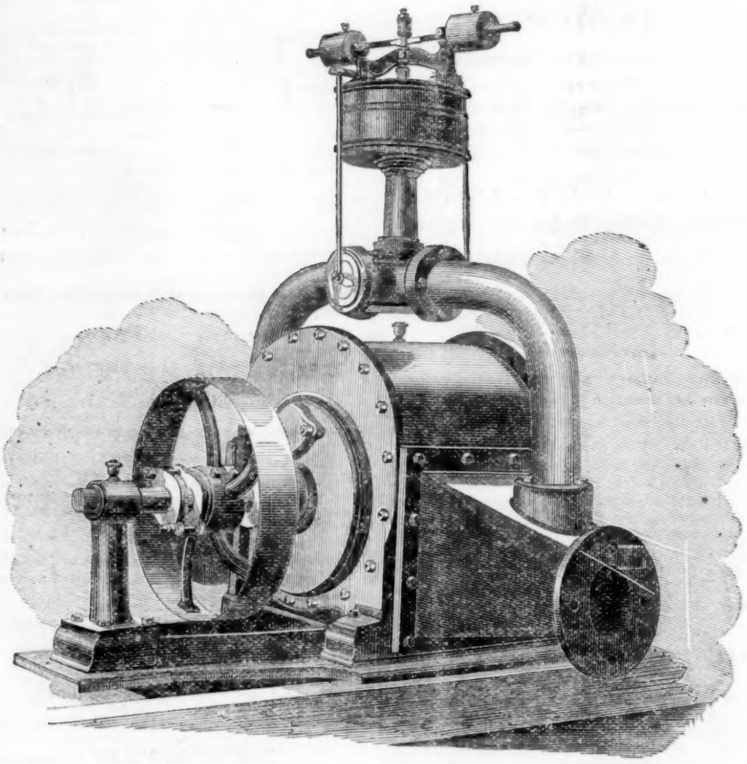

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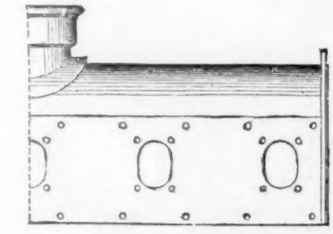

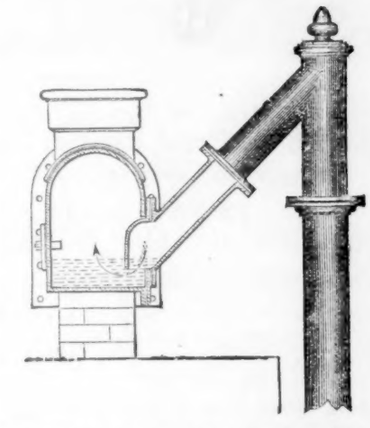

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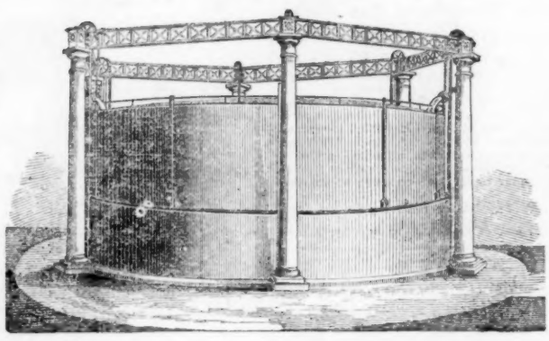

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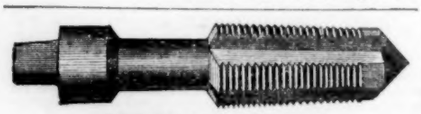

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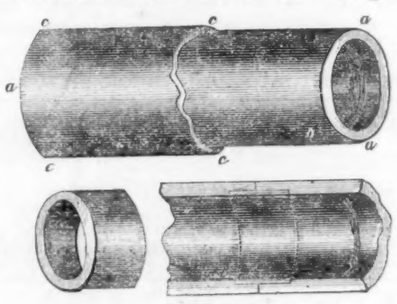

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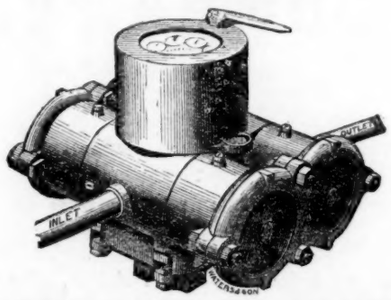

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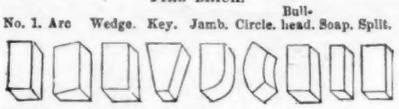

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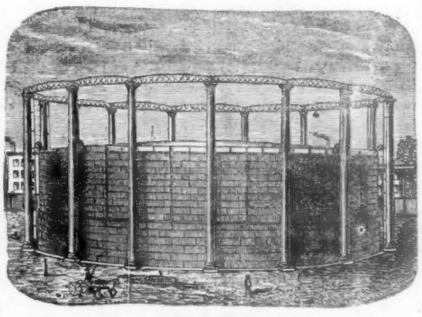

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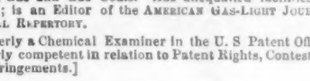

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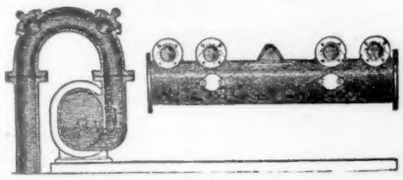

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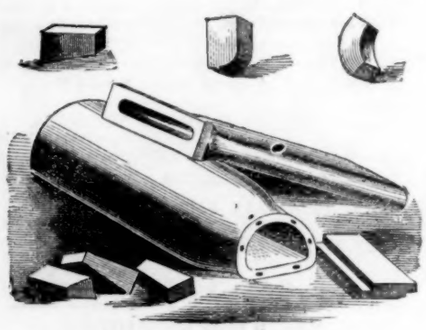

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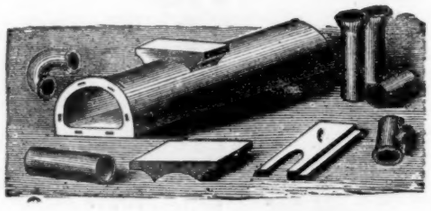

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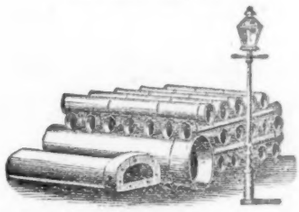

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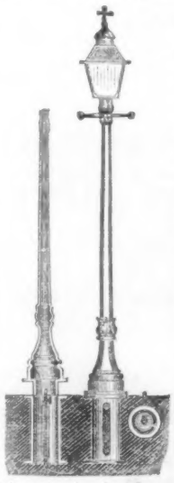

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